

Miniaturized Low-Power Piezo Microvalve for NanoSat and CubeSat Propulsion, Phase I

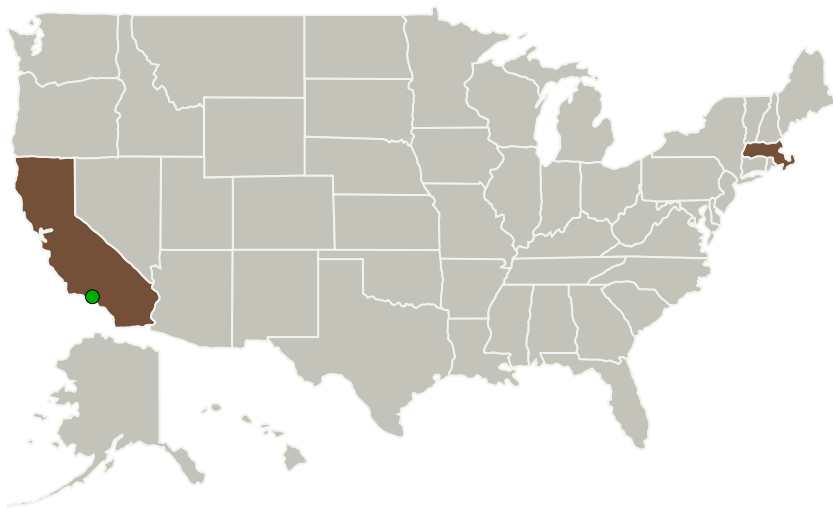
Completed Technology Project (2010 - 2010)



Project Introduction

In space propulsion applications, an increasingly unmet need is compact, low-power, precision flow regulating valves. Propulsion for increasingly small spacecraft is limited by the availability of such valves. Although much work on miniaturizing valves has been performed using microfabrication approaches, few of these efforts have resulted in technologies suitable for propulsion. Busek proposes a piezo-actuated microvalve suitable for continuous regulation of gas, resolved to flowrates of better than 10^{-3} sccm, enabling precision control of cold gas thrusters, resistojets, and low-power ion and Hall thrusters. Busek's fluid microvalve, developed for colloid thruster operation on NASA's ST7 project, has demonstrated resolving fluid flow to 2.5 picoliters/s over the 0-60 microliter/s regime for 1 atm source pressure (Δp); preliminary microvalve gas tests indicate the ability to resolve gas flows to 10^{-2} sccm over the 0-.25 sccm regime for similar Δp . The valve architecture, when used with smaller available orifice diameters, provides 1-2 orders of magnitude lower flowrates. The focus of the effort shall be improvement of several design aspects in Busek's existing valve design, upgrading the design for high pressure gas service, and novel repackaging into a volume of approximately 4cm^3 .

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Busek Company, Inc.	Lead Organization	Industry Women-Owned Small Business (WOSB)	Natick, Massachusetts
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations

California	Massachusetts
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Project Transitions

**January 2010:** Project Start**July 2010:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140015>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

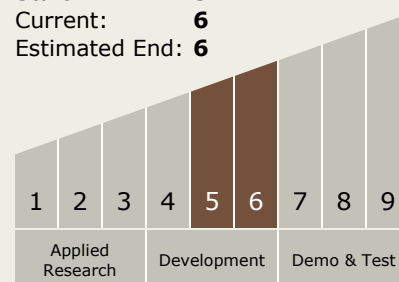
Carlos Torrez

Principal Investigator:

Douglas C Spence

Technology Maturity (TRL)

Start: 5
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX01 Propulsion Systems
 - └ TX01.2 Electric Space Propulsion
 - └ TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System